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ENTOMOLOGICAL NEWS

VOL. LXII JULY, 1951 No. 7

New Records of Maine Dragonflies (Odonata)

By DONALD J. BORROR, Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio

Since the appearance of the latest list of the Odonata of Maine (Borror, 1944), four additional summers of collecting by the writer in south-central Maine have yielded a number of new records of Odonata. Many of these represent new locality or new county records, and the records of four species represent new state records. These four species bring the total number of species of Odonata for Maine to 119.

There has been considerable dragonfly collecting in some sections of Maine, but other sections remain relatively unexplored, at least as far as the dragonfly fauna is concerned. The table below, which includes the records in this paper, represents fairly well the thoroughness of dragonfly collecting in different parts of Maine.

TABLE I. Species of Odonata Recorded from Maine Counties

Androscoggin	9	Oxford	21
Aroostook	4	Penobscot	85
Cumberland	15	Piscataquis	20
Franklin	6	Sagadahoc	17
Hancock	80	Somerset	5
Kennebec	80	Waldo	30
Knox	47	Washington	15
Lincoln	90	York	22

In the following list the species are numbered as in the writer's 1944 list. The four species new to Maine are *Coenagrion interrogatum* (No. 116), *Erythrodiplax berenice* (No. 117), *Libel-*

lula (*Holotania*) *cyanea* (No. 118), and *Erythemis simplicicollis* (No. 119). The locality records, which are records not previously published, are listed by counties (COUNTY names are in CAPITALS). Locality names are taken from the topographic maps of the U. S. Geological Survey. Detailed data are given only for the new county records; in the case of records from new localities in counties from which a species has previously been reported, only the localities are listed. The records from counties marked with an asterisk (*) are new county records. All material listed, together with that indicated by locality names only, is in the writer's collection. The dates following the new records of each species are the extreme dates for collections of adults, based on eight seasons of records (June 9 through August 29) by the writer in south-central Maine.

1. **Agrion aequabile** (Say). KNOX: Warren. LINCOLN: Winslow Mills. 6/20–7/27.

2. **Agrion maculatum** Beauvais. KNOX: Razorville, Stickney Corner. LINCOLN: Muddy Pond, Muscongus, Seitensparker Pond, Winslow Mills. 6/17–8/24.

4. **Lestes congener** Hagen. *AROOSTOOK: Monticello, 2 ♀, 7/29/50; Houlton, 2 ♀, 7/30/50. KENNEBEC: Vassalboro. LINCOLN: Biscay Pond, Medomak, Pemaquid Pond. 7/13–8/28.

5. **Lestes disjunctus** Selys. KENNEBEC: East Pittston, Hamilton Pond, Vassalboro. KNOX: Warren. LINCOLN: Adams Pond, Cooper Mills, Jefferson, Knowlton Corner, Medomak, Muscongus, Nobleboro, Round Pond, Sherman Lake, South Waldoboro. SAGADAHOC: Richmond Corner, Woolwich. WALDO: Liberty, North Searsmont. 6/30–8/29.

6. **Lestes dryas** Kirby. LINCOLN: Biscay Pond, McCurdy Pond. 6/16–8/10.

7. **Lestes eurinus** Say. LINCOLN: New Harbor. 6/29–7/19.

8. **Lestes forcipatus** Rambur. KENNEBEC: Hamilton Pond, Vassalboro. LINCOLN: McCurdy Pond, Muscongus, New Harbor, Somerville. 6/30–8/26.

9. **Lestes inaequalis** Walsh. *KNOX: North Pond, 1 ♂, 7/3/48, 1 ♂, 6/20/50; Warren, 1 ♀, 7/3/48. LINCOLN: Biscay Pond, Nobleboro. *WALDO: North Searsmont, 1 ♂ and 1 ♀, 7/27/46. 6/16–7/27.

10. **Lestes rectangularis** Say. KENNEBEC: Litchfield Plains, Vassalboro. KNOX: Razorville. LINCOLN: Biscay Pond, Cooper Mills, Medomak, Muddy Pond, Muscongus, Nobleboro, Round Pond, Sherman Lake, Somerville, South Waldoboro, Sprague Corner. *SAGADAHOC: Richmond Corner, 1 ♂, 7/16/50. WALDO: Frankfort, North Searsmont. 6/11–8/26.

11. **Lestes unguiculatus** Hagen. KENNEBEC: East Pittston, Vassalboro. LINCOLN: Biscay Pond, Medomak. *SAGADAHOC: Popham Beach, 2 ♂ and 1 ♀, 7/27/48, 1 ♂, 7/28/50. 6/21–8/29.

12. **Lestes vigilax** Hagen. KNOX: Warren. LINCOLN: Adams Pond, Cooper Mills, McCurdy Pond, Medomak Pond, Nobleboro. WALDO: North Searsmont. 6/14–8/29.

13. **Argia moesta** (Hagen). LINCOLN: Biscay Pond, Winslow Mills. 6/14–7/31.

14. **Argia violacea** (Hagen). HANCOCK: Tunk Mountain. KENNEBEC: Togus Pond. KNOX: Razorville, Warren. LINCOLN: Adams Pond, Cooper Mills, Knickerbocker Lakes, Muddy Pond, Muscongus, Seitensparker Pond, South Waldoboro, Winslow Mills. SAGADAHOC: Woolwich. WALDO: Frankfort, North Searsmont. 6/12–8/29.

16. **Nehalennia irene** (Hagen). *AROOSTOOK: Monticello, 1 ♂ and 1 ♀, 7/29/50; Houlton, 1 ♀, 7/30/50. KENNEBEC: East Pittston, Litchfield Plains, Vassalboro. KNOX: Harbor Island, Otter Island. LINCOLN: Adams Pond, Jefferson, Medomak, Medomak Pond, Nobleboro, Round Pond, Sherman Lake, South Waldoboro, Winslow Mills, Wreck Island. *SAGADAHOC: Richmond Corner, 2 ♀, 7/6/50; Woolwich, 1 ♀, 8/12/46. WALDO: Frankfort, North Searsmont. 6/11–8/24.

17. **Chromagrion conditum** (Hagen). *KNOX: Razorville, 1 ♂, 7/17/46. LINCOLN: Biscay Pond, Jefferson, McCurdy Pond. 6/14–7/17.

18. **Enallamga aspersum** (Hagen). *KNOX: Forest Pond, 1 ♂, 8/15/48. LINCOLN: New Harbor. 7/8–8/24.

19. **Enallagma boreale** Selys. *KNOX: Razorville, 1 ♂, 6/23/48. LINCOLN: Biscay Pond. 6/9–7/22.

20. **Enallagma civile** (Hagen). KNOX: Eastern Egg Rock, Warren. LINCOLN: Adams Pond, Duckpuddle Pond, Little Medomak Pond, Nobleboro, Sherman Lake. 6/20–8/27.

22. **Enallagma divagans** Selys. KNOX: Warren. 6/20–7/3.

23. **Enallagma ebrium** Hagen. *AROOSTOOK: Monticello, 7 ♂, 7/29/50. KENNEBEC: East Pittston, Litchfield Plains, Vassalboro. *KNOX: Razorville, 1 ♂ 7/17/46. *LINCOLN:

Adams Pond, 1 ♂, 7/7/46; Biscay Pond, 2 ♂, 6/26/48; Dresden Mills, 1 ♀, 7/7/48; Jefferson, 1 ♂, 7/14/46; Muscongus Island, seen (collected by a student) 6/23/49; New Harbor, 1 ♂, 7/18/48; Somerville, 1 ♂, 7/17/46. *SAGADAHOC: Richmond Corner, 4 ♂, 7/16/50. 6/23–8/1.

24. **Enallagma exsulans** (Hagen). KNOX: Warren. LINCOLN: Biscay Pond, Winslow Mills. 6/20–8/8.

25. **Enallagma geminatum** Kellicott. KNOX: Warren. LINCOLN: Pemaquid Pond. *WALDO: Liberty, 2 ♂, 7/27/46, 4 ♂, 7/29/50. 6/30–8/20.

26. **Enallagma hageni** (Walsh). *AROOSTOOK: Monticello, 2 ♂, 7/29/50. KENNEBEC: East Pittston, Litchfield Plains. KNOX: Crystal Pond, Warren. LINCOLN: Adams Pond, Back Meadow Brook, Cooper Mills, Dresden Mills, Hog Island, Jefferson, Knickerbocker Lakes, Medomak, Muscongus, Nobleboro, Sherman Lake, Sprague Corner, Winslow Mills. WALDO: Frankfort, Liberty, North Searsmont. 6/9–8/22.

28. **Enallagma minusculum** Morse. LINCOLN: Biscay Pond. 6/12–8/19.

29. **Enallagma signatum** (Hagen). *LINCOLN: Duckpuddle Pond, 1 ♀, 8/3/48, 1 ♂, 8/16/48; Medomak Pond, 2 ♂ and 1 ♀, 7/7/49; Pemaquid Pond, 1 ♀, 6/26/49. 6/26–8/16.

30. **Enallagma vesperum** Calvert. LINCOLN: Adams Pond, Knickerbocker Lakes. 6/14–8/19.

116. **Coenagrion interrogatum** (Selys). *LINCOLN: Jefferson, 1 ♂, 7/3/48. There are a number of records of this boreal bog species in eastern Canada, but this is the first record of it in northeastern United States.

31. **Coenagrion resolutum** (Hagen). *KENNEBEC: East Pittston, 1 ♀, 7/7/48. LINCOLN: Jefferson, Medomak, Medomak Pond, Muscongus Island, Webber Pond. 6/18–7/14.

32. **Ischnura kellicotti** Williamson. *LINCOLN: Biscay Pond, 1 ♂, 7/28/46; Webber Pond, 1 ♀, 7/7/50 (by A. C. Borror), 2 ♂ and 1 ♀, 7/10/50 (by A. C. Borror). There is only one other record of this species in Maine, a male and three females taken by Mattie Wadsworth near Manchester (Kennebec Co.), 7/2/00 (Wadsworth 1902). These records are the most northeastern records of the species. 7/7–7/28.

33. **Ischnura posita** (Hagen). LINCOLN: Back Meadow Brook, Biscay Pond, McCurdy Pond, Webber Pond. 6/16–8/23.

34. **Ischnura verticalis** (Say). *AROOSTOOK: Monticello, 1 ♀, 7/29/50. KENNEBEC: Litchfield Plains, Vassalboro.

KNOX: Crystal Pond, Razorville, Warren. LINCOLN: Adams Pond, Cooper Mills, Jefferson, Knickerbocker Lakes, Medomak, Muddy Pond, Nobleboro, Round Pond, Sherman Lake, South Waldoboro, Sprague Corner, Winslow Mills. SAGADAHOC: Richmond Corner, Woolwich. WALDO: Frankfort, North Searsmont. 6/9–8/29. This is the most abundant and widespread species of dragonfly the writer has taken in Maine; eight seasons of collecting have yielded 357 records of it, as compared with 275 records of the next most common species, *Enallagma hageni.*

35. **Anomalagrion hastatum** (Say). LINCOLN: Keene Neck, New Harbor. 8/9–8/27.

36. **Hagenius brevistylus** Selys. *KNOX: Warren, seen 8/8/49. LINCOLN: Biscay Pond, Nobleboro, Webber Pond. *WALDO: Liberty, 1 ♂, 7/27/46. 6/14–8/11.

43. **Gomphus (Gomphurus) abbreviatus** Hagen. *LINCOLN: Winslow Mills, 1 ♀, 7/3/48, 1 ♀, 6/20/50. 6/20–7/3.

45. **Gomphus (Gomphus) exilis** Selys. KNOX: Warren. LINCOLN: Biscay Pond, Damariscotta Pond, Dick's Pond,[1] Duckpuddle Pond, Hastings Pond, Sherman Lake, Seitensparker Pond. *WALDO: Liberty, seen 7/27/46. 6/9–8/26.

48. **Dromogomphus spinosus** Selys. *LINCOLN: Webber Pond, 1 ♂ (teneral) 6/26/50 (by Ruth W. Long). 6/26–7/29.

49. **Lanthus albistylus** (Hagen). *KNOX: Razorville, 1 ♂, 7/17/46.

51. **Gomphaeschna furcillata** (Say). LINCOLN: McCurdy Pond, Sprague Corner. 6/12–6/30.

52. **Basiaeschna janata** (Say). KNOX: North Pond, 1 ♂ and 1 ♀, 6/20/50. LINCOLN: Dresden Mills. 6/12–7/13.

53. **Boyeria vinosa** (Say). *KNOX: Forest Pond, seen 8/8/46. LINCOLN: Biscay Pond, Muddy Pond, Muscongus. 8/5–8/26.

54. **Anax junius** (Drury). KENNEBEC: Litchfield Plains. KNOX: Harbor Island, Matinicus Rock. LINCOLN: Cooper Mills, Little Medomak Pond, Nobleboro, Sherman Lake. 6/12–8/29.

55. **Epiaeschna heros** (Fabricius). *KNOX: Forest Pond, 1 ♂, 6/18/50. *LINCOLN: Hog Island, seen 6/25/46; Muscongus, 1 ♂, 6/24/46 (by Virginia Armstrong), seen 7/2/48; Muscongus Island, seen 6/26/46 and 6/18/48. 6/18–7/2.

[1] This pond is not named on the U. S. Geological Survey topographic map, and is locally called both Dick's Pond and Ross's Pond. It is in Bristol Twp., about a mile north of Hastings Pond.

56. **Aeschna canadensis** Walker. KENNEBEC: Hamilton Pond, Vassalboro. LINCOLN: Biscay Pond, Medomak, Round Pond. 7/8–8/29.

62. **Aeshna tuberculifera** Walker. LINCOLN: Adams Pond, Biscay Pond. 8/3–8/28.

63. **Aeshna umbrosa** Walker. LINCOLN: Keene Neck, Medomak. 7/26–8/28.

65. **Cordulegaster diastatops** (Selys). LINCOLN: Hog Island, Webber Pond. 6/17–6/25.

66. **Cordulegaster maculatus** Selys. LINCOLN: Muscongus. 6/22–7/8.

69. **Macromia illinoiensis** Walsh. *LINCOLN: Pemaquid Pond, 1 ♀, 7/23/49; Winslow Mills, 1 ♀, 7/14/46 (by A. C. Borror), 2 ♂, 7/3/48, seen 6/20/50. 6/20–7/23.

70. **Didymops transversa** (Say). LINCOLN: Hastings Pond, Keene Neck, Muscongus, Muscongus Island, Sherman Lake, Winslow Mills. 6/15–7/17.

73. **Epicordulia princeps** (Hagen). *LINCOLN: Hog Island, 1 ♀, 8/13/46 (by H. L. Cogswell). This specimen and the other two collected by the writer in Maine (North Pond, Knox Co., ♂, 7/17/40 and ♀, 6/20/50) lack a nodal spot; only one (the one from Hog Island) has any coloring at the base of the hind wing, and this coloring is chiefly in the antenodal and basilar spaces, and above the triangle; all three have a dark apical wing spot that extends about halfway to the stigma from the wing tip.

75. **Tetragoneuria cynosura simulans** Muttkowski. KNOX: Warren. LINCOLN: Dick's Pond (see footnote 1, p. 213), Hastings Pond, Nobleboro. 6/12–7/29.

77. **Tetragoneuria spinigera** Selys. LINCOLN: Pemaquid Pond. 6/15–6/29.

78. **Helocordulia uhleri** (Selys). LINCOLN: Biscay Pond. 6/16–7/22.

79. **Somatochlora elongata** (Scudder). *LINCOLN: Webber Pond, 1 ♀, 8/24/46 (by Paul D. Urbano).

82. **Somatochlora kennedyi** Walker. LINCOLN: Jefferson, Pemaquid Pond. 6/12–7/28.

84. **Somatochlora tenebrosa** (Say). *LINCOLN: Hog Island, 1 ♂, 8/7/49 (by Jeff Swinebroad).

86. **Somatochlora williamsoni** (Walker). *LINCOLN: Webber Pond, 1 ♀, 8/14/50.

88. **Dorocordulia lepida** (Hagen). LINCOLN: Biscay Pond, Damariscotta Pond, New Harbor, Nobleboro. 6/11–8/18.

89. **Dorocordulia libera** (Selys). LINCOLN: Adams Pond, Biscay Pond, Hog Island, Jefferson, Winslow Mills. 6/19–7/31.

91. **Nannothemis bella** (Uhler). LINCOLN: Jefferson, North Waldoboro. 6/14–8/22.

92. **Celithemis elisa** Hagen. LINCOLN: Duckpuddle Pond, Nobleboro. *WALDO: Liberty, 2 ♂, 7/27/46, seen 7/29/50. 6/17–8/29.

93. **Celithemis martha** Williamson. LINCOLN: Biscay Pond, Little Medomak Pond, New Harbor. 6/26–8/26.

117. **Erythrodiplax berenice** (Hagen). *LINCOLN: Hog Island, 1 ♂, 8/8/49 (by Robert Thatcher). *SAGADAHOC: Popham Beach, 7 ♂ and 8 ♀, 7/28/50. These are the first records of this species in Maine, and except for one Quebec record (East Bolton, Gibson 1913) are the northernmost records of the species. Judging from its abundance in the brackish marshes back of Popham Beach (7/28/50), it is probable that this species occurs in similar marshes all along the coast, at least in the western half of the state. Of the eight females collected, six had brownish spots in the wings and the other two had clear wings.

94. **Libellula (Eolibellula) semifasciata** Burmeister. LINCOLN: Hog Island, Webber Pond. 6/20–7/2.

118. **Libellula (Holotania) cyanea** Fabricius. *SAGADAHOC: Richmond Corner, 1 ♂, 7/16/50. This is the first record of this species in Maine, and represents the most northeastern record of the species.

95. **Libellula (Holotania) incesta** Hagen. KENNEBEC: Litchfield Plains. *KNOX: Forest Pond, seen 8/15/48; North Pond, seen 7/7/49; Razorville, 1 ♂, 7/17/46; Warren, 2 ♂, 8/8/49. LINCOLN: Cooper Mills, Duckpuddle Pond, Medomak Pond, New Harbor, Pemaquid Pond. *WALDO: Liberty, seen 7/27/46, 1 ♂, 7/29/50. 7/5–8/18.

96. **Libellula (Holotania) luctuosa** Burmeister. LINCOLN: Biscay Pond, Keene Neck, Muscongus Island, Sherman Lake. *WALDO: Liberty, seen 7/29/50. 7/1–8/11.

97. **Libellula (Ladona) exusta** Say. *KNOX: North Pond, seen 7/3/48. LINCOLN: Biscay Pond, Davis Island, Duckpuddle Pond, Little Medomak Pond, New Harbor, Nobleboro, Sherman Lake, Sprague Corner. 6/11–7/28.

98. **Libellula (Ladona) julia** Uhler. LINCOLN: Hastings Pond, New Harbor, Pemaquid Pond. 6/14–7/22.

99. **Libellula (Libellula) quadrimaculata** Linnaeus. KINNEBEC: East Pittston. KNOX: Razorville. LINCOLN: Adams

Pond, Biscay Pond, Jefferson, McCurdy Pond, Medomak, New Harbor, Nobleboro, Somerville, Winslow Mills. 6/12–8/5.

100. **Libellula (Neotetrum) pulchella** Drury. KENNEBEC: Litchfield Plains, Vassalboro. KNOX: Matinicus Rock. LINCOLN: Adams Pond, Keene Neck, Medomak, Muscongus, New Harbor, Nobleboro, South Waldoboro, Winslow Mills. *WALDO: Frankfort, seen 7/24/48. 6/21–8/27.

101. **Libellula (Plathemis) lydia** Drury. LINCOLN: Adams Pond, Biscay Pond, Muscongus Island, New Harbor, Nobleboro, Round Pond, South Waldoboro. 6/19–8/24.

102. **Sympetrum costiferum** (Hagen). KNOX: Forest Pond. LINCOLN: Cooper Mills, Hastings Pond, Muscongus. *WALDO: Liberty, 2 ♂ and 1 ♀, 7/27/46. 7/20–8/29.

104. **Sympetrum internum** Montgomery. KENNEBEC: East Pittston, Togus Pond, Vassalboro. KNOX: Harbor Island. LINCOLN: Adams Pond, Cooper Mills, Jefferson, Medomak, Muddy Pond, Muscongus, Nobleboro, Sherman Lake, Somerville, South Waldoboro. *SAGADAHOC: Richmond Corner, seen 7/16/50; Woolwich, 1 ♂, 8/12/46. *WALDO: Liberty, 1 ♀, 7/27/46, seen 7/29/50; North Searsmont, 1 ♂, 7/27/46. 6/23–8/29.

105. **Sympetrum obtrusum** (Hagen). KENNEBEC: Vassalboro. LINCOLN: Biscay Pond, Cooper Mills, Medomak, Muscongus, New Harbor. 6/28–8/29.

106. **Sympetrum semicinctum** (Say). LINCOLN: Biscay Pond, Cooper Mills. *WALDO: Liberty, 1 ♂, 7/27/46. 7/27–8/13.

107. **Sympetrum vicinum** (Hagen). KENNEBEC: Vassalboro. *KNOX: Warren, 2 ♀, 8/8/49. LINCOLN: Adams Pond, Cooper Mills, Medomak, New Harbor, Nobleboro, South Waldoboro, Winslow Mills. *SAGADAHOC: Woolwich, 1 ♂, 8/12/46. 7/7–8/29.

108. **Leucorrhinia frigida** Hagen. *KENNEBEC: East Pittston, 1 ♂, 7/7/48; Hamilton Pond, 3 ♂, 8/1/49. LINCOLN: Biscay Pond, Little Medomak Pond. 6/18–8/7.

110. **Leucorrhinia hudsonica** (Selys). LINCOLN: Biscay Pond, Jefferson, North Waldoboro, Pemaquid Pond. 6/11–7/28.

111. **Leucorrhinia intacta** (Hagen). KENNEBEC: East Pittston, Litchfield Plains. KNOX: North Pond. LINCOLN: Adams Pond, Back Meadow Brook, Biscay Pond, Jefferson, McCurdy Pond, Medomak, Muscongus, New Harbor, Nobleboro, Winslow Mills. *SAGADAHOC: Richmond Corner, seen 7/16/50. WALDO: Liberty. 6/12–7/31.

112. **Leucorrhinia proxima** Calvert. KENNEBEC: East Pittston. LINCOLN: Jefferson, McCurdy Pond, Medomak, Nobleboro, Somerville. 6/12–8/22.

113. **Pachydiplax longipennis** (Burmeister). *LINCOLN: Hog Island, 1 ♀, 7/6/49 (by Robert L. Birch). This is the second record of this southern species in Maine.

119. **Erythemis simplicicollis** (Say). *LINCOLN: Biscay Pond, an adult ♂ seen 8/23/49; Medomak, 1 ♀, 7/19/50; New Harbor, an adult ♂ seen 7/19/50; Sherman Lake, 1 ♀, 7/16/50. These are the first records of this species in Maine, and represent the most northeastern records of the species.

114. **Pantala flavescens** (Fabricius). LINCOLN: Keene Neck, New Harbor, Round Pond. 7/16–8/27.

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Corrections to the Paper on "The Male Genitalia of Syrphus, Epistrophe and Related Genera" (Diptera: Syrphidae).

By C. L. FLUKE, University of Wisconsin

Unfortunate circumstances caused a number of errors to appear in the above-named paper published in the Transactions of the Wisconsin Academy of Sciences, Arts and Letters Vol. 40: pp. 115–148, August 15, 1950. My purpose in calling attention to these mistakes is primarily to correct a very serious error due to mislabelling of the specimens of two species described by me in 1942 (Revision of the Neotropical Syrphini Related to Syrphus; American Mus. Novitates No. 1201).

The two species referred to are *Epistrophe remigis* Fl. and *Epistrophe altissima* Fl. The identification labels on these two

species became interchanged and the error was not noticed until the paper on the genitalia had been published. The original descriptions are in order and the holotypes are properly labelled to agree with them.

Specimens of *altissima,* labelled *remigis* were sent out to several of my friends and no serious trouble would have resulted except that Dr. Hull (Trans. Zool. Soc. London, Vol. 26: p. 293, 1949) erected a new subgenus, *Metepistrophe,* for *remigis* Fl., but it was evidently based on the specimens so labelled, which were actually *altissima* Fl.

The paper on genitalia carried this new subgenus and added *argentipila* Fl. to it, but here again it was done on mislabelled specimens of *remigis.* My interpretation places *remigis* (correctly labelled) under the genus *Episyrphus* and places *altissima* under *Metepistrophe.*

The errors that have come to my attention at this time are given below:

Page 115, 2nd paragraph, 7th line, read *Metasyrphus* for *Matasyrphus.*
Heading of each odd-numbered page 117–147, read genitalia for genetalia.
Page 119, Fig. 19, read *invigorus* for *ivigorus.*
Page 121, Figs. 49 and 60, read *lasiophthalmus* for *lasiopthalmus.*
Page 124, Fig. 97, read *remigis* for *altissimus.*
Page 125, Fig. 97, read *remigis* for *altissimus.*
Page 126, Figs. 124 and 130, read *altissimus* for *remigis.*
Page 127, Figs. 124 and 130, read *altissimus* for *remigis.*
Page 139, third paragraph, first line, read fourth for third.
Page 139, fourth paragraph, first line, read third for fourth.
Page 139, line seven from the bottom, read *remigis* for *altissima.*
Page 140, second paragraph, line one, read *altissimus* for *remigis.*
Page 141, fourth line from the bottom, read *talus* for *tylus.*
Page 142, second paragraph, enclose *venustus* Meig. in brackets.
Page 145, line 19, read *remigis* for *altissimus.*
Page 145, last line, read *altissimus* for *remigis.*
Page 148, reference 12, add London after Soc.

Notes on Habits and "Broods" of June Beetles [1]

By R. D. Shenefelt and H. G. Simkover, University of Wisconsin, Madison, Wisconsin

Certain observations made during a four-year study of June beetles at Wisconsin forest tree nurseries regarding feeding habits, flight habits and "broods" of June beetles are believed worthy of recording.

A. Feeding Habits

In general, June beetles are not supposed to feed on conifers, but European larch at Griffith State Nursery, in central Wisconsin, was so heavily utilized in 1949 that the branches were nearly stripped for a distance of about 12 inches from the tip. Table 1 lists the species and the percentages collected from larch. Of all June beetles collected from vegetation at the nursery in 1949, 14.20% were taken from this host. In contrast, in 1947 no specimens were found on larch, only one in 1948, and very few in 1950.

Table 1. Per Cent June Beetles Taken from Larch at Griffith State Nursery During 1949

Species	Total from all hosts	% from larch
Phyllophaga crenulata (Froehl.)	442	14.25
Phyllophaga drakii (Kby.)	503	9.34
Phyllophaga fusca (Froehl.)	2	50.00
Phyllophaga prunina (Lec.)	105	37.14
Phyllophaga rugosa (Melsh.)	103	20.39
Phyllophaga tristis (Fab.)	55	1.82

Two specimens of *crenulata* were taken from white spruce in 1949 after being observed while eating the young, succulent needles.

[1] Results of a cooperative project between the College of Agriculture of the University of Wisconsin and the Wisconsin Conservation Department. Approved for publication by the Director of the Wisconsin Agricultural Experiment Station.

There appears to be a particular physiological condition of the host which proves attractive to the beetles since they are drawn in large numbers to specific plants in a given year while other plants of the same species are avoided. For example, *tristis* in 1948 was attracted to one bur oak in large numbers (823 having been taken one night) while another bur oak of about the same size and apparently in the same condition attracted almost no beetles although it stood within 20 feet of the first. The tree which attracted large numbers in 1948 was fed upon by only a few beetles in 1950, although *tristis* was very numerous on other trees. Furthermore, the attractiveness varies during the feeding season, i.e., some, but not all, trees lose the ability to draw the beetles.

B. Flight Habits

(1). *Height of flight.*—During a 28 day period in 1947 five light traps at the Griffith Nursery, placed at a height of about five feet, averaged 41.48 June beetles captured per night per trap. Meanwhile, a trap located on a fire tower at the nursery at 17 feet averaged 55.74 or 1.35 times the number taken in those at five feet. Another trap located on the tower at 44 feet averaged 3.70 beetles or only 6.6% of that at 17 feet. One located at 72 feet, which was operated for fifteen nights, caught 62.2% as many beetles as the one at 44 feet during the same nights. A trap at 92 feet took no beetles during four nights although the trap at 17 feet averaged 174 beetles for these nights. However, the towerman stated that it was not unusual to find June beetles in his room at the top of the tower, approximately 102 feet, if the windows were left open at night. There were no obvious differences in the proportions of the sexes which were captured at the different heights.

A total of over 6,000 marked males, of several species, was liberated at various times just before dusk. The majority rose to an estimated height of 30–35 feet before leveling off.

From these observations, and from watching the insects come to the trees in the evening, the writers believe that the average height of flight of June beetles is higher than the literature would lead one to believe.

(2). *Nocturnal activity.*—June beetles are supposed to emerge from the soil or litter within a relatively short period in the evening and literally swarm to the host plants where mating and feeding commence at once. Supposedly they remain rather quiescent until near dawn when they move back to the ground. However, *tristis* is the only species at the nurseries that has been observed to swarm in this manner.

Apparently some unknown stimulus is responsible for the rhythmic nocturnal activity and diurnal quiescence. Beetles in the laboratory become active in the evening even when a strong light is shown on the cage continuously and although the temperature remains unchanged. When brought into the laboratory from cold storage and warmed up they show the same sort of rhythm regardless of the time of year.

A light trap which segregates insects caught during hourly intervals has been operated for the past four years. Collections made in this trap indicate that the time of maximum attractiveness of the traps is from approximately 9:30 P.M. to 1:30 A.M. From the evidence obtained, it appears that the beetles fly to the host plants and settle down about dusk or later, feed for a time, and then fly and feed sporadically throughout the remainder of the night. In general, the proportion of females to males captured becomes smaller as the night progresses, reaching the lowest point at about 1:30 A.M. and then increasing somewhat up to 4:30 A.M.

C. "Broods"

The authors question the validity of the use of the terms "Brood A," "Brood B," and "Brood C" in the sense in which these terms have been used by writers in the past, e.g., Davis (1918, p. 6). The term "brood" is defined by Torre Bueno as "all the individuals that hatch at about one time, from eggs laid by one series of parents and which normally mature at about the same time." If used to indicate the year of flight, the term "brood" is misleading.

A survey of the literature amply demonstrates that the length of time required for the development of June beetles is dependent

upon the specific conditions encountered. Davis (1916, p. 263) wrote, "It is easy to understand why a species should have a three-year life cycle in the latitude of Indiana and a four-year cycle in northern Wisconsin, where the season is so short, and, on the other hand, why the same species, in the southern states where the growing season is much longer, should require but two years to complete its growth. *It is, however, puzzling to find that the same species in the same cage may complete its cycle in two years in one case but require three years in another.*" (Italics by present writers.)

C. L. Fluke, University of Wisconsin, and T. R. Chamberlin, U.S.D.A., B.E.P.Q., have informed the writers that they have reared *tristis* in 3 months and *rugosa* in 9 months in the greenhouse. While *tristis* has a two-year cycle in central Wisconsin, it has a one-year cycle at about the same latitude in Michigan according to W. F. Morofsky, Michigan State College.

The time of emergence of adults for feeding and mating varies from year to year. For instance, a difference of nearly a month has been observed in the time of major flight during the four years records have been kept at Griffith State Nursery. Furthermore, egg laying and feeding may be delayed by cold weather and the total period of flight drawn out. In 1947 *prunina* was taken in light traps from May 25 to as late as September 10 and in 1948 *crenulata* was captured from May 14 to August 25. While these represent extreme flight periods, it is readily observable from the records obtained that the flight periods of many of the species are long. In addition, some females remain alive in soil cages and continue to oviposit for some time after the flight is apparently completed.

In contrast, adult beetles removed from cold storage in February ate forced willow leaves within a few days in the laboratory and were later fed head lettuce. Eggs were found as early as the middle of March.

Eggs of *rugosa* were obtained in 1948 from June 28 to August 19 from outdoor rearing cages and in 1950 some viable eggs were still present in early September. Incidentally, eggs of *futilis* have been held in cold storage for a full year before being allowed to hatch.

In late November, 1947, at a time when the ground was frozen to a depth of three inches, 265 larvae were taken from a 16-foot cage stocked during the summer with adults of *rugosa, prunina,* and *anxia.* The larvae were kept in cold storage and examined under binoculars on December 4. The fact that grubs of these three species may overwinter in the first instar was established when 70 of the 265 were found to still retain the hatching spines on the metathorax.

All of these facts substantiate the idea that the developmental period of June beetles is dependent upon the particular environment under which the insects exist. They further indicate that it would be entirely possible for "the same species in the same cage to complete its cycle in two years in one case but require three years in another" and thus for a portion of "Brood A" to become "Brood B."

Within a given locality, the period of oviposition for different species may occur in different years when the lengths of the life cycles are not the same. Such species cannot possibly constitute a "brood" in the accepted sense of the term since they neither hatch at the same time nor are the eggs laid by one series of parents.

In addition, there are great differences between localities in the species present and it does not seem correct to regard one set of species as belonging to the same "brood" as another, perhaps entirely different, set. In fact, it does not appear justifiable to regard even two different species as forming one "brood," although their cycles may coincide.

In view of the circumstances, the authors believe that the word "flight" should be substituted for the word "brood" and be used to indicate the population of adult June beetles for a given year.

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Biological Notes on Two Species of Chrysopidae (Neuroptera)

By J. W. TILDEN, San Jose State College, San Jose, California

Chrysopa cockerelli Banks

Two larvae of this species were taken in March, 1948, already nearly grown. This would indicate that this species develops early in the season. These larvae are "peddlers," carrying trash on the dorsum, entangled in the cuticular spines. The material is of several sorts. Larval exuviae, exoskeletons of prey, bits of dried leaves, strands of vegetable fiber and unidentified material were found, and certain minute fungi grow on the accumulation, giving it a dark color. This mass is not discarded at ecdysis, but the larva molts under the mass, retaining the major portion.

One larva was placed under a binocular microscope and the "pack" carefully removed. For a day or so thereafter the larva was nearly nude, but exoskeletons of prey (aphids) began to appear and at the final molt the cast skin was added so that by the time the larva was ready to pupate, it was again covered with debris. Oddly enough, actual placing of material was never observed in spite of careful watching.

Feeding of the larvae of this species is very similar to that of the much more common *Chrysopa ploribunda* Fitch.

The cocoon of this species is spherical and is covered by the trash of the "pack," and so appears dark in color and inconspicuous. The pupal period was eighteen days. Emergence is by means of a round "lid" as in *ploribunda.*

Chrysopa ploribunda Fitch

Most of the observations made on this species verify the work of numerous others and are not worth repeating, but certain observations on spinning and voracity appear to be of interest.

At maturity, the larva crawls to a sheltered place and prepares to spin its cocoon. Crannies in leaves of bark are usually chosen. The larva spins with the tip of the abdomen, which is moved back and forth in a manner analogous to the movements

of the head in spinning caterpillars. Withycombe (1924, pp. 369–371) has shown that the source of the silk is the modified malpighian tubules.

A few loose strands are tied first over the whole surface in loose loops. Within this preliminary structure, the larva curls up with the head turned in toward the abdomen. The tip of the abdomen is then directed outward and is moved freely, in movements involving the three or four terminal segments. In this way silk is laid down in short figures of eight patterns, as far as the insect can reach without uncurling. From time to time the larva rolls slightly, continuing to spin as it turns. In this way all parts of the cocoon receive about the same amount of silk. It should be noted that the outer supporting strands are double, caused by the circumstance that in spinning these strands the larva touches the tip of the abdomen to the surface on which it rests, and then to adjacent surfaces, subsequently returning the abdomen to the original position. One strand is spun with the outward movement and another with the return movement, spinning being continuous.

The loose preliminary strands form the outer part of the cocoon, while the denser inner part is formed during the revolving process described above. The inner portion, while closely woven, is not thick and the curled up larva is visible after the cocoon is complete. After spinning is complete, the prepupal condition is assumed, lasting from three to seven days before pupation occurs.

Aphids (*Aphis helichrysi* Kalt.) were used in experiments on food habits with the larvae of this species. These aphids occur in small colonies on the tips of the food plants. It is rather difficult to determine the exact number of aphids eaten, since the growth of the colony in some cases nearly equals the rate of feeding by *Chrysopa*. Third instar larvae depleted a colony in two or three days, destroying it. Very small second instar larvae, however, did not bring such a colony under control. From this it is believed that a colony of this species of aphid can support one *Chrysopa* larvae without being exterminated.

It is inexact to count the exoskeletons of the aphids on the bottom of the container without carefully determining which are

carcasses and which are normal exuviae of the aphids; hence notes on the number of aphids eaten by one larva are not as clear cut as might be desired, but it can be stated that a colony of twenty or more aphids (as of the time of collection) was destroyed in forty-eight hours by third instar larvae as a rule. Individual observations indicate that from seven to fourteen large aphids may be eaten by one third instar *Chrysopa* larva without stopping.

Using the aphid colony as a population unit, it was ascertained that a third instar *Chrysopa* larva will destroy three or four colonies of this species of aphid during the six or eight days that comprise the length of this final instar. This indicates a predator of great efficiency.

It also becomes apparent that the third instar of *Chrysopa ploribunda* is the most effective by far, mainly because of its larger size.

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Current Entomological Literature

COMPILED BY R. G. SCHMIEDER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the year 1951 unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For other records of general literature and for economic literature, see the Bibliography of Agriculture, Washington, and the Review of Applied Entomology, Series A, London. For records of papers on medical entomology see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of periodicals and serials published in our January and June issues. The number of the volume, and in some cases, the part, heft, &c. is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

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Note—Catalogues of slide films (Agricultural Handbook No. 14) and of motion pictures on insects (Agr. Hand. No. 17) may be had from the Extension Service, and from the Motion Picture Service, respectively, U. S. Dept. Agr., Washington 25, D. C.

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